DOCUMENT RESUME

ED 322 353 CE 055 473

TITLE Engine & Vehicle Mechanics Curriculum.
INSTITUTION Alaska State Dept. of Education, Juneau. Div. of Adult and Vocational Education.
PUB DATE 87
NOTE 85p.
PUB TYPE Guides - Classroom Use - Guides (For Teachers) (052)

EDRS PRICE MF01/PC04 Plus Postage.
DESCRIPTORS *Auto Mechanics; *Competency Based Education; Curriculum Development; Educational Objectives; Employment Qualifications; *Engines; *Motor Vehicles; *Occupational Information; Postsecondary Education; Secondary Education; State Curriculum Guides; Teacher Role; Trade and Industrial Education
IDENTIFIERS *Alaska

ABSTRACT

This competency-based curriculum includes all competencies a student will acquire in an engine and vehicle mechanics educational program. It follows guidelines established for automobile technician training programs leading toward certification and addresses requirements of the National Institute for Automotive Service Excellence (ASE). The handbook is organized in seven sections. Section 1 introduces the concept of competency-based curriculum. The role of vocational educators in curriculum planning, implementation, and evaluation is discussed. Section 2 provides the scope, sequence, and hierarchy of engine and vehicle mechanics competencies. Section 3 presents the curriculum, including the competencies and tasks for the following topics: laboratory safety; tools and lab equipment; basic engine fundamentals; employability skills; automotive engine service; transmissions and drive trains; brakes; suspension, steering, and alignment; accessories; and climatic care. Section 4 contains course descriptions to assist school districts in developing their vocational programs. Section 5 provides curriculum analysis matrices to be used to determine competencies to be included in specific engine and vehicle mechanics courses. Section 6 provides a sample skills card for evaluating and recording student progress. Section 7 provides a 15-page list of resources and specific materials available in Alaska and nationally. Suggested tools and shop equipment are listed, as identified by the ASE. (CML)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED322353

Engine & Vehicle Mechanics Curriculum

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☒ This document has been reproduced as received from the person or organization originating it.

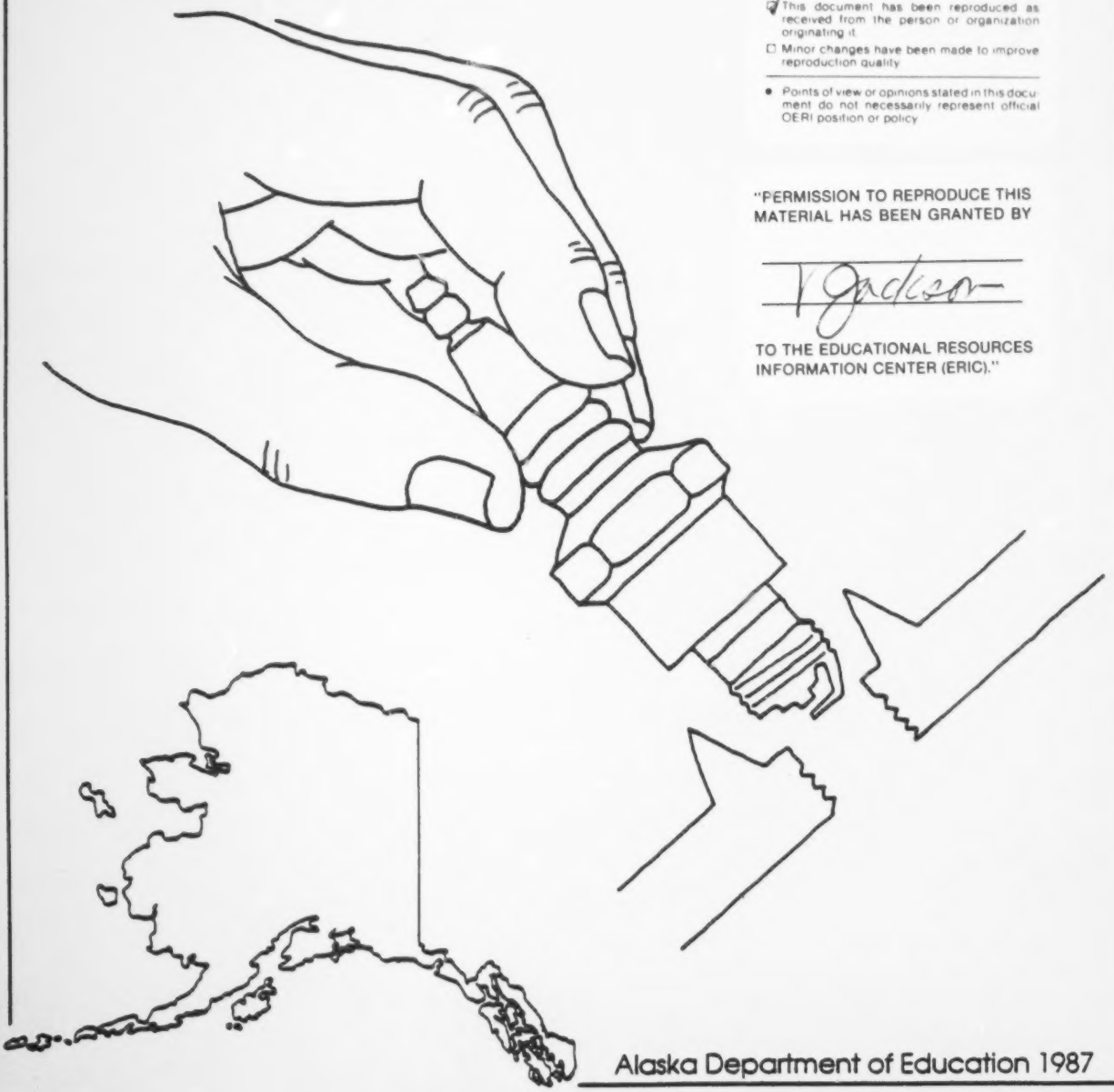
☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

T Jackson

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."



Alaska Department of Education 1987

CE 055 473

BEST COPY AVAILABLE

Engine & Vehicle Mechanics Curriculum

State of Alaska
Steve Cowper, Governor

Developed by the
ALASKA DEPARTMENT OF EDUCATION
Adult and Vocational Education

William Demmert, Commissioner

Karen Ryals, Acting Director for Vocational Education

This publication was prepared with the support of U.S. Department of Education funds under the Carl Perkins Vocational Education Act, PL 98-524. Copies are available from the Alaska Department of Education, Adult and Vocational Education, Alaska Vocational Materials Library, Box F, Juneau, Alaska 99811, (907) 465-2980. This publication may be duplicated.

Alaska Department of Education 1987

The Alaska Department of Education is an equal opportunity employer and will not discriminate in Department employment, supervision, practices, services or educational programs on the basis of race, religion, color, national origin, age, sex, handicap, marital status, changes in marital status, pregnancy, parenthood, veteran's status, veteran's disability or political affiliation.

Table of Contents

Foreword ____ i

Acknowledgements ____ iii

I. Introduction to Competency-Based Curriculum

Competency-Based Curriculum ____ 3
Curriculum Delivery Systems ____ 4
Role of Instructor in Curriculum Planning, Implementation and Evaluation ____ 4

II. Program Development ____ 9

Hierarchy of Engine and Vehicle Mechanics Competencies ____ 10

III. Competencies and Tasks

Basic Automotive Competencies
Laboratory Safety ____ 13
Tools and Laboratory Equipment ____ 17
Basic Engine Fundamentals ____ 21
Employability Skills ____ 25

Automotive Service Competencies
Automotive Engine Service ____ 33
Electrical Systems ____ 41
Automotive Transmissions & Drive Trains ____ 43
Brakes ____ 45
Suspension, Steering & Alignment ____ 47
Accessories ____ 49
Climatic Care ____ 51

IV. Course Descriptions ____ 55

V. Curriculum Analysis Matrices ____ 59

VI. Sample Skills Card ____ 73

VII. Suggested Resources ____ 77

Foreword

This competency-based curriculum is designed to be a handbook for the engine and vehicle mechanics trades. It includes all competencies a student will acquire in an engine and vehicle mechanics educational program and also follows guidelines established for automobile technician training programs leading toward certification and addressing requirements of the National Institute for Automotive Service Excellence (ASE).

Development of this handbook began with a survey of Alaskan engine and vehicle mechanics employers. Their priorities regarding the skills and knowledge students need to acquire to survive and thrive in the industry form the basis of this handbook. For example, industry's emphasis on the importance of communication and personal skills is reflected in the employability skills unit.

The handbook stresses the importance of understanding the principles associated with the various elements of engine and vehicle mechanics. Units begin with definition of terms and principles so that students will have conceptual frameworks to which they may add the details of various techniques. The eleven units, divided into basic and automotive service competencies, are fundamental to engine and vehicle mechanics. The competencies and tasks are presented so that instructors have the prerogative to determine which aspects they want to teach in basic, intermediate, and advanced level courses.

The handbook is organized in seven sections:

Section I introduces the concept of competency-based curriculum. The role of vocational educators in curriculum planning, implementation and evaluation is also included.

Section II provides the scope, sequence, and hierarchy of engine and vehicle mechanics competencies.

Section III presents the curriculum including the competencies and tasks for engine and vehicle mechanics instruction.

Section IV contains course descriptions to assist school districts in developing their vocational programs.

Section V provides curriculum analysis matrices to be used to determine competencies to be included in specific engine and vehicle mechanics courses.

Section VI contains a sample skills card for evaluating and recording student progress.

Section VII lists information on resources and specific materials available in Alaska and the rest of nation. Suggested tools and shop equipment are also included and are copied from the *Tools and Equipment Manual for the NATEF Automobile Technician Training Certification Program* of the National Institute for Automotive Service Excellence.

It is recommended that all students participate in career awareness and exploration experiences to help them understand the connection between school and work and make career plans.

Acknowledgements

Special appreciation is expressed to Richard Steele and Carin Smolin who coordinated the preparation and completion of this handbook, and to Mark Hanson, Associate Director of the South East Regional Resource Center, who administered this project.

This handbook reflects the competencies needed for entry-level employment because of the input of Alaskan engine and vehicle mechanics professionals. Thanks and recognition go to the following technical committee members for their assistance and cooperation:

A to Z Auto Marine & Machine Shop, Juneau
Complete Auto Centers, Fairbanks
Dan's Automotive, Anchorage
Dorn Auto Parts and Services, Inc., Kiana
Eero Volkswagen, Anchorage
Fairbanks Alignment and Repair Center, Fairbanks
Grizzly Automotive, Tok
Mike's Auto, Petersburg
Ninilchik VLG Auto and Boat, Ninilchik
Oceanside Auto and Marine Salvage, Soldotna
Operating Engineers Apprenticeship Program, Anchorage
R & M Truck Repair, North Pole
R & P Small Engine Repair, Fairbanks
Shorty's Auto Body, Anchorage
SSS Automotive Services, Fairbanks
Starkey Auto and Small Engines, Anchorage
Valley Automotive, Unalaska

A task force of Alaskan educators in engine and vehicle mechanics helped to define the units, competencies, and tasks. The task force which met to finalize this handbook deserves a great deal of credit for their hard work and valuable input:

Bill Brandner, Juneau-Douglas High School, Juneau
Matts Ekstrand, Careers Vocational Training School, Anchorage
Larry Tillotson, Ketchikan High School, Ketchikan

Special thanks are due South East Regional Resource Center employees Dave Wood who designed the graphics and layout for the handbook, and Kirk Barnes for production assistance.

Thanks also go to the National Network for Curriculum Coordination in Vocational and Technical Education (NNCCVTE) and participating states for providing resource materials which improved the quality of this handbook and saved months of work.

Finally, Verdell Jackson, Curriculum Specialist for the Office of Adult and Vocational Education, must be recognized for participating in every step of the handbook's development and ensuring that it is a model Alaskan curriculum of the highest quality.

Karen Ryals
Acting Director
Office of Adult and Vocational Education
Alaska Department of Education
July 1987

Introduction to Competency-Based Curriculum

Competency-Based Curriculum

Vocational education should be directed toward the skills, knowledge, and attitudes needed for successful employment. Changes in technology are affecting the job requirements in engine and vehicle mechanics. Such changes require mechanics educators to continually update their curriculum in order to prepare students for competition in the job market.

An effective method for delivering vocational education is through a competency-based curriculum. This curriculum is based on a task analysis of the key occupations in engine and vehicle mechanics. Once a competency-based curriculum is set in place, student performance must be measured on levels of proficiency in those competencies. Thus, the critical features of competency-based education are:

1) validating competencies to be included in the curriculum; and
2) evaluation of student competency levels.

This curriculum handbook sets direction for local curriculum developers. It provides a framework for developing courses of study and lesson plans in local schools.

Curriculum Based On Competencies

Competence refers to the adequate performance of a task. The task may be evaluated according to the performance or process, the product, or both.

Competency-Based Vocational Education consists of programs that derive their content from the tasks performed in each occupation/job and assess student performance on the basis of preset performance standards.

Learning materials define the competencies the student is to learn, the criteria by which the student will be evaluated, and the conditions under which the evaluation will occur.

Competency-based instruction places emphasis on the ability to do, as well as on learning how and why. Student performance and knowledge are individually evaluated against the stated criteria, rather than against group norms.

The competency process utilizes a checklist of attitudes, knowledge and skills that are commonly needed by entry-level employees in engine and vehicle mechanics occupations. In developing this curriculum handbook, a cross-section of engine and vehicle mechanics professionals were asked to respond to the checklist on the basis of needs within their own establishments. The checklists were tallied and summarized to determine which attitudes, knowledge and skills were common to firms in Alaska. Also, the competencies in each area were ranked as to decreasing importance.

Student Performance Assessment

A curriculum becomes competency-based when students are assessed on the basis of their competence. Sample skill cards are provided in this guide for teachers who wish to use them in assessing the competency levels of their students. The card has four levels of proficiency which allow continued development of skills. The card can be used to monitor students' progress as they move between engine and vehicle mechanics classes, between teachers and grade levels and between school and work. The completed skills card is an important part of a placement portfolio when students begin their job searches.

Curriculum Delivery Systems

Vocational Student Leadership Organizations

Some of the competencies in this curriculum guide cannot be fully met in traditional classroom and lab settings. The Vocational Industrial Clubs of America (VICA) is a delivery system which can be integrated into the regular school program. Human relations skills as well as job skills will be enhanced by student participation in VICA. VICA activities should complement instruction in the engine and vehicle mechanics classroom and lab. They should be integrated as a curriculum delivery system and not allowed to become an extracurricular activity.

Cooperative Work Experience

Some of the competencies identified in this guide cannot be fully developed at a school site. A work station in the community offers realistic experiences in fulfilling the program goals in career development and human relations. Cooperative Work Experience offers an excellent vehicle for the delivery of instruction. With well developed training plans, teachers and employers can cooperate to prepare students for employment. Cooperative Work Experience extends the instructional program beyond the availability of equipment and instructor time at the local school. Teachers and employers must maintain regular communications to assure that students are receiving a high quality experience.

The Rural Student Vocational Program (RSVP) provides a two week fulltime work experience for students from rural areas where job stations are limited or non-existent.

The Job Training Partnership Act (JTPA) provides on-the-job experience to disadvantaged youth in both urban and rural areas.

Role of Instructor in Curriculum Planning, Implementation and Evaluation

The vocational instructor fulfills many roles which include the following responsibilities:

- Prepares a written vocational program plan.
- Develops and maintains a written program philosophy with objectives that support the philosophy.
- Maintains a written list of competencies identified as needed for the program area.
- Devises and maintains a classroom management system for implementing the curriculum materials provided for the program area.
- Evaluates the curriculum content periodically to determine curriculum changes and updates. This includes the involvement of the students (present and former), advisory committee members, and other personnel.
- Selects units of instruction and plans lesson plans based on the competencies of the occupation.

- Provides appropriate instructional materials, supplies, and equipment for the students to use.
- Reviews the instructional materials to assure that they are free from sex bias and sex role stereotyping.
- Works with an advisory committee.
- Assists and/or serves as an advisor to the appropriate student organization related to the vocational program area.
- Plans and arranges an appropriate classroom learning environment. This involves assisting students of different abilities to work at their own pace and in cases where remedial instruction is needed, securing additional help for those students.
- Reinforces basic skills of reading, communication (written & oral) and computation through vocational education experiences.
- Helps determine what objective(s) should be established for handicapped students as a part of the individual educational plan (IEP) development.
- Uses a grading procedure that is made available to all students at the beginning of their training.
- Sets an example for grooming and dress that is generally found in the occupational area in business or industry to enable students to establish appropriate standards.

Benefits of the Competency-Based Curriculum

Competency-based vocational education offers several benefits to students:

1. The competencies/tasks are directed to the student and provide measurable criteria for determining when the student has acquired the necessary knowledge and skills.
2. Students receive realistic training for the job. They become competent in tasks that are relevant to the occupation.
3. Students know what is expected of them throughout the course. The competencies are made available to them at the onset. They know what they will be doing and how well it must be done.
4. Each student is individually responsible for completing each competency attempted in the curriculum.
5. Students are not compared with other students in their accomplishments because each is expected to work according to his/her individual capabilities and learning style. Because of the various evaluation policies of different school systems, the ideal of not comparing students in determining grades is not always possible. However, the basic thrust of the competency-based program is to evaluate each student according to his/her accomplishment of each task as he/she works up to individual capability.

II
Program Development

Program Development

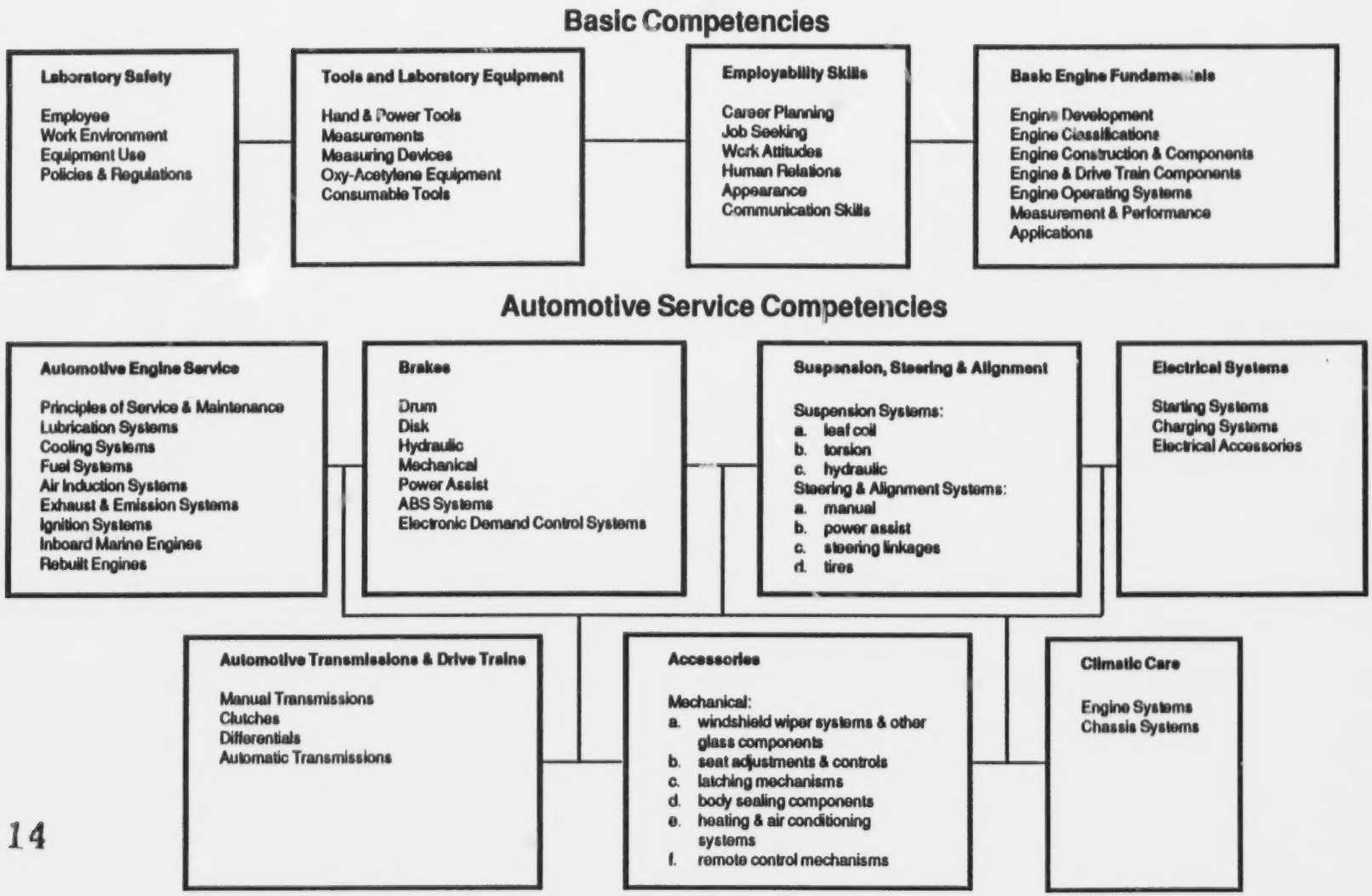
The format of this handbook was selected to aid administrators and teachers in concentrating on the skills needed for vocational training. It will assist in selecting the array of units and the delivery system which fit the school. This provides the flexibility of varying the course content to include the most valuable skills as appropriate for the scope and sequence. The primary importance is that students are able to secure foundation skills. Schools can vary their delivery systems to maximize student opportunities by:

1. Offering courses on alternate years or other planned sequences
2. Offering two or more courses in the same class
3. Providing individualized materials and instruction

A matrix is included in this guide for use in planning the courses to be offered and the content of each course.

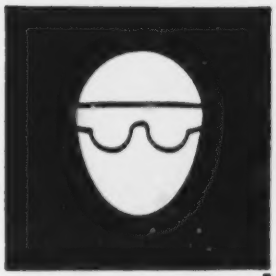
The following chart shows the hierarchy of engine and vehicle mechanics competencies and details basic and specialized automotive service competencies.

Hierarchy of Engine & Vehicle Mechanics



III
Competencies and Tasks

Laboratory Safety



Competency: Understand the organization of the laboratory

Tasks: Identify and explain:

a. laboratory operation policies
b. location of laboratory equipment and materials
c. safety hazards
d. traffic patterns
e. work storage areas/work stations
f. location of emergency assistance and first-aid stations and fire exits

Competency: Use safety procedures

Tasks: Follow safety rules for:

a. safe housekeeping
b. controlling fires
c. dealing with electricity
d. applying first-aid
e. using hand tools
f. operating machines

Identify components of a fire triangle and the effects of water, oil, and other flammable liquids

Use safety equipment in the laboratory

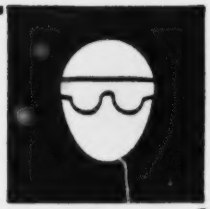
Demonstrate general shop and personal safety

Keep a clean, orderly, and safe working area

Competency: Use hazardous chemicals safely

Tasks: Identify and explain the use of caustic and toxic chemicals such as:

a. flammable liquids
b. asbestos
c. acid
d. caustics - lyes, sodium hydroxide, steam cleaning fluids, floor cleaners
e. poisonous automotive-related liquids
f. hazardous wastes and carcinogens



Explain the use and dangers associated with hazardous chemicals

Use first-aid treatment for accident victims

Competency: Report faulty laboratory equipment

Tasks: Explain proper use and operation of equipment such as:

a. stationary equipment
b. portable equipment

Identify faulty equipment

Explain reporting procedures for faulty equipment

Competency: Maintain a clean shop

Tasks: Keep floors and workbenches clean and neat

Wipe oil and grease spots immediately

Keep rags in self-closing or spring-lid metal containers

Place scrap materials in proper containers or locations

Clean and replace all tools to cabinets, racks and other storage locations

Keep aisles, traffic areas, and exits free of materials and other debris

Competency: Follow OSHA guidelines

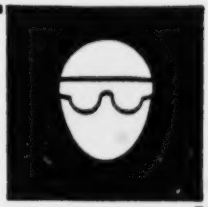
Tasks: Explain the purpose of the Occupational Safety and Health Act (OSHA)

Explain the importance of the OSHA Automotive Industry Shop Safety Standards

Identify worker rights under OSHA

Discuss how to resolve hazardous and OSHA violation situations

Competency: **Prevent work-related injuries**



Tasks: Describe the importance of safe working attitudes

Administer basic first-aid and CPR

Report injuries and accidents

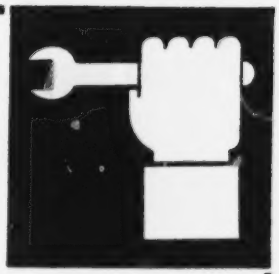
Wear protective gear including:

a. hat or net to restrain long hair
b. eye and ear protection
c. respirators or filter masks
d. gloves
e. chaps
f. long sleeves
g. boots and steel-toed boots
h. shop garments

Follow safety procedures for:

a. electrical tools
b. soldering
c. hydraulic lifts
d. jacks
e. hand and power tools
f. ladders
g. pneumatic tools
h. lifting
i. working on gas tanks
j. inflating tires
k. noise
l. driving
m. working in enclosed areas

Tools and Laboratory Equipment



(A) Indicates Advanced Competency or Task

Competency: **Use hand tools**

Tasks: Identify the proper use of hand tools such as:

a. ball peen hammers
b. soft face hammers
c. slip joint pliers
d. diagonal cutting pliers
e. lock ring pliers
f. needle nose pliers
g. snap ring pliers
h. vise grip pliers
i. standard slot type screwdrivers
j. Phillips screwdrivers
k. offset screwdrivers
l. torx screwdrivers
m. Robertson screwdrivers
n. sockets
o. wrenches

Dress a grinding wheel

Use taps and dies

Draw file a flat surface

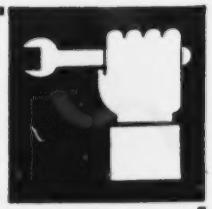
Reshape a cold chisel

Check a torque wrench for accuracy

Sharpen a twist drill

(A) Fit a helicoil to a hole

(A) Use a reamer



Competency: Use metric measurements

Tasks: Explain basic metric measurements such as meters, liters, and kilos

Convert conventional measurement units to metric such as:

a. yard to meter
b. inch to centimeter
c. mile to kilometer
d. quart to liter
e. inch to millimeter

Competency: Use measuring devices

Tasks: Identify terms associated with measuring including:

a. steel rule
b. gradation
c. error
d. reliable measure
e. reference point

Use: a. plain micrometer
b. inside caliper
c. outside caliper
d. dial indicator
e. venier caliper

Competency: Use power tools

Tasks: Demonstrate the operation of:

a. electric hand-held tools
b. pneumatic power tools
c. electric stationary equipment such as:
   1. drill press
   2. bench grinder
d. pneumatic stationary equipment

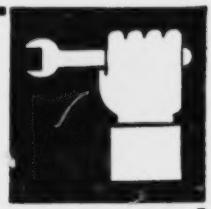
Competency: Operate oxy-acetylene equipment

Tasks: Use oxy-acetylene equipment for:

a. brazing
b. soldering

Explain the use of the oxy-acetylene torch as a source of heat for part removal or as a source of assembly

Competency: **Use fasteners, gaskets, and sealants**



Tasks: Explain the use of fasteners, gaskets and sealants

Explain the classification of fasteners and proper torques

Basic Engine Fundamentals

Competency: **Understand combustion engine development**

Tasks: Describe the development of the combustion engine

Differentiate between internal and external combustion engines

Competency: **Classify engines**

Tasks: Explain the different ways engines are classified such as:

a. internal/external combustion engines
b. fuels: gasoline, diesel, propane
c. physical shape of engine
d. two-cycle, four-cycle, rotary

Competency: **Understand engine construction and components**

Tasks: Explain terms and fundamental principles associated with engine construction

Identify the function of the:

a. engine block
b. cylinder head
c. crankshaft
d. connecting rods
e. pistons
f. valve train

Competency: **Identify engine drive train components**

Tasks: Explain terms and fundamental principles associated with engine drive trains

Describe the functions of:

a. gear systems
b. belt systems
c. chains
d. hydraulic systems

Competency: **Understand engine operating systems**

Tasks: Explain the terms and fundamental principles associated with engine operating systems

Explain fuel systems such as:

a. fuel injection
b. carburetion
c. air supply and recycling

Identify lubrication systems for:

a. engine systems
b. chassis systems
c. drive trains

Identify types of lubricants such as:

a. dry lubricants
b. liquid lubricants
c. paste lubricants

Explain ignition systems including:

a. points and condensor
b. electronic systems
c. computerized systems

Explain cooling systems such as:

a. liquid
b. air
c. combinations of liquid and air

Competency: **Understand engine measurement and performance**

Tasks: Explain terms and fundamental principles associated with mechanical power and its production including:

a. control
b. cycle
c. energy
d. force
e. friction
f. horsepower
g. kinetic energy
h. potential energy
i. power
j. PSI (Pounds per square inch)
k. reciprocating motion
l. TDC (top dead center)
m. torque

n. transmission
o. work
p. VD

Calculate the formula for:

a. work
b. horsepower
c. torque

Explain the importance of measurements and tolerances

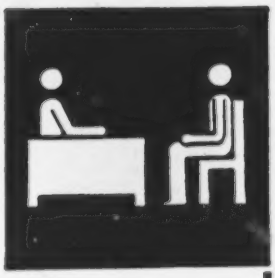
Explain engine and mechanical efficiencies

Competency: Identify engine applications

Tasks: Differentiate between automotive engine applications and other applications such as:

a. marine
b. aircraft
c. stationary engines
d. turbine

Employability Skills



Competency: Identify career choices

Tasks: Conduct a self-assessment:

a. assess values in relation to work
b. recognize skills and aptitudes
c. assess employment history and experience
d. describe obstacles to employment
e. use Alaska Career Information System and other career counseling systems and publications (ie. ASVAB)

Identify career clusters:

a. list specific jobs and duties within clusters
b. describe apprenticeship/training programs
c. describe advanced training opportunities

Use labor market information:

a. describe the current local labor market
b. identify growth/demand occupations
c. relate career choices to local labor market

Select a career goal:

a. list how skills could be used in other jobs
b. develop specific steps to reach goal

Competency: Identify jobs in the engine and vehicle mechanics industry

Tasks: Identify educational and occupational opportunities such as:

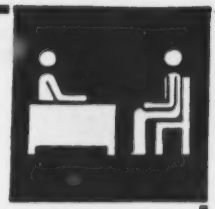
a. adult, postsecondary vocational training
b. special grants from automotive industry
c. federal, state and local funding

Locate resources for finding employment

Confer with prospective employers

Explain the work of a(an):

a. automotive technician
b. small engine technician
c. marine technician
d. parts shop salesperson



e. automotive salesman
f. automotive machine shop technician
g. automotive diagnostic technician
h. automotive service writer
i. automotive foreman
j. garage shop owner
k. manufacturers technical representative
l. computer parts inventory technician

Competency: Prepare a resume and job application

Tasks: Obtain a social security number

List: a. past and present work experience
b. hobbies and interests
c. community activities or memberships
d. in-school activities or memberships
e. awards, positions, or club offices
f. adult references, including addresses and phone numbers

Obtain extra copies

Read job applications carefully

Follow instructions

Complete all items accurately

Write legibly

Verify references before listing them

Competency: Write a cover letter

Tasks: Explain when and how to write a cover letter

Explain what a writing sample tells a potential employer

List the things the cover letter must include

Competency: Prepare for an interview

Tasks: Explain how to contact an employer to schedule an interview

Describe questions and responses asked in an interview

Explain proper etiquette for an interview

Describe how to dress for an interview

Competency: Follow up the interview

Tasks: Analyze the interview

Determine whether a follow-up letter or call is required

Explain how to write a thank-you note or make a follow-up call

Competency: Dress appropriately on the job

Tasks: Identify proper attire for engine and vehicle technician jobs such as:

a. mechanics
b. parts salesperson

Be neat and clean

Competency: Identify personal responsibilities related to employment

Tasks: Secure adequate transportation

Identify adequate child care alternatives

Inventory independent living skills

Develop a personal finance plan

Discuss employer's expectations regarding substance abuse

Competency: Maintain good health for effective job performance

Tasks: Explain the relationship between regular exercise, adequate rest, nutrition, and job performance

Discuss the issue of smoking on the job

Discuss drug abuse as it relates to employment and job performance

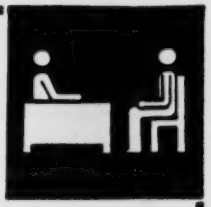
Competency: Identify employee rights and responsibilities

Tasks: Discuss state labor laws relating to compensation

Describe:

a. use of tax forms
b. minimum wage and types of exempt businesses
c. employee benefits, rights and responsibilities
d. labor contracts, grievance procedures and the role of unions

Describe a sample personnel policy



Competency: **Apply reading and writing skills**

Tasks:

Find information in trade and consumer magazines and journals

Write work orders, parts orders and warranty reports

Locate and correct errors in spelling, grammar, and punctuation

Use supply catalogs to identify and order materials

Use a calculator

Talk politely on the telephone

Use good penmanship

Competency: **Deal effectively with customers**

Tasks:

Greet the customer

Talk politely to customer

Obtain all necessary information from customer in writing

Identify the business on the telephone

Relay customer complaints to employer

Competency: **Demonstrate work maturity**

Tasks:

Describe the importance of openness to new situations

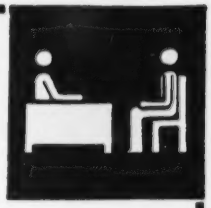
Demonstrate characteristics of the mature person:

a. self-acceptance
b. consideration and respect for others
c. self-control
d. positive thinking and attitudes
e. flexibility
f. initiative

Identify ways to develop and maintain good work relationships

Differentiate between personal and job-related problems

Follow orderly and systematic work behavior



Competency: **Solve problems**

Tasks: Explain the importance of having a method for analyzing and solving problems

Use the problem-solving process:

a. identify problems
b. obtain information
c. analyze problems
d. develop and analyze alternative solutions
e. choose a course of action
f. persevere through hardships
g. recognize and change otherwise unworkable solutions

Competency: **Demonstrate initiative and productivity**

Tasks: Organize time effectively

Be responsible

Care about the quality of work

Competency: **Be assertive**

Tasks: Differentiate between assertive, aggressive, and passive behavior

Discuss whom to go to for employee problems

Competency: **Be honest**

Tasks: Define honesty and integrity

Explain how to deal with theft and dishonesty

Relate employee integrity to overall company performance

Competency: **Be reliable and dependable**

Tasks: Maintain acceptable attendance records

Be on time

Give timely notice of interruptions to work schedule

Follow rules of work site or training site

Competency: Maintain good personal relations

Tasks: Use positive attitudes with others

Accept supervision and criticism

Cooperate with others

Accept the chain of command

Competency: Follow verbal and written directions

Tasks: Ask for clarification

Use listening skills

Review situations of poor communications

Read directions when assembling and repairing equipment

Competency: Identify proper job termination procedures

Tasks: Write a letter of termination

Conduct an exit interview

Write a letter of recommendation

Request for advance notice

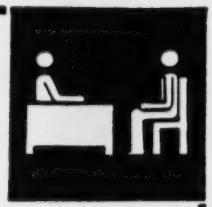
Make final settlements (in regards to retirement, physical injury, social security, severance pay, etc.)

Competency: Use effective leadership skills

Tasks: Describe the Vocational Industrial Clubs of America (VICA) and how it teaches leadership skills:

a. participate in meetings according to rules of parliamentary procedure
b. function effectively on committees by accepting assigned responsibilities
c. p'an and conduct effective group leadership activities
d. participate in society in a democratic way
e. be punctual and dependable
f. follow rules, standards and policies
g. work cooperatively with others

Demonstrate leadership characteristics and responsibilities



Competency: **Understand how to be an entrepreneur**

Tasks: Explain terms and principles associated with entrepreneurship

Describe the role of self-employment in the free enterprise system

Identify types of business organizations including:

a. sole proprietarship
b. limited partnership
c. partnership
d. corporation

Identify personal traits necessary for self-employment

Identify risks and rewards of starting a new business

Identify the role small businesses have played in job creation and new products and services

Explain:

a. the steps for establishing a business
b. the importance of developing a business plan
c. where to locate information and assistance on starting a small business

Automotive Engine Service

(A) Indicates Advanced Competency or Task

Competency: Apply principles of service and maintenance

Tasks: Explain the importance of scheduled maintenance and service

Follow shop equipment procedures for equipment such as:

a. lifts
b. jacks
c. impact air tools
d. grinders
e. steam cleaners
f. hot tanks

Wear appropriate clothing and personal safety devices such as:

a. gloves
b. safety glasses
c. steel-toed boots

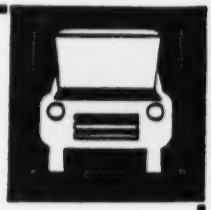
Follow procedures for maintaining a safe automotive working environment including:

a. procedures for working around operating engines in closed spaces
b. the proper use of tools and parts
c. handling and storage procedures for gasoline and other flammable and hazardous materials
d. safe blocking and lifting procedures

Competency: Use service and repair manuals

Tasks: Explain how to locate information

Use manufacturer's technical and parts manuals and cross-reference materials



Competency: Perform routine automotive maintenance

Tasks: Explain terms and fundamental principles associated with automotive maintenance

Check and adjust fluid levels including:

a. radiator
b. master cylinder
c. battery
d. engine oil
e. transmission
f. differential
g. windshield washer
h. power steering

Demonstrate how to:

a. check and adjust tire pressure
b. change:
   1. engine oil and filter
   2. air filter
   3. spark plugs
   4. light bulbs and wiper blades
c. adjust fan belt tension
d. clean battery terminals and perform basic battery tests
e. lubricate moving parts such as:
   1. door hinges
   2. hood hinges
   3. windows
   4. chassis components
f. review owners manual to determine any unique or special maintenance procedures

Competency: Service lubrication systems

Tasks: Explain terms, fundamental principles, components and functions of lubrication systems including:

a. additives
b. API
c. ASTM
d. blow-by
e. friction
f. MIL
g. multi-grade oil
h. oil gally
i. pressure relief valve
j. SAE
k. sludge
l. viscometer
m. viscosity
n. "W" oils

34

Troubleshoot lubrication systems

Demonstrate procedure for engine lubrication service

Use special tools and equipment

Use lubrication charts

Competency: Service cooling systems

Tasks: Explain terms, fundamental principles, components and their functions of cooling systems

Use special tools

Use repair and service manuals

Demonstrate:

a. use of cooling system flushing equipment
b. proper procedure for back-flushing
c. pressure testing of cooling system
d. how to test the strength and condition of coolant
e. inspection of cooling system hoses and clamps

Explain the function of thermostats, fan belts, pressure caps, and radiators

Demonstrate how to troubleshoot cooling systems

Service, check/replace:

a. water hoses
b. drive belts
c. thermostat
d. water pump
e. radiator
f. thermal sensing switch
g. variable speed fan clutch
h. electric cooling fan motor
i. (A) heater cores

(A) Service cooling systems for marine applications

Competency: Service carburetor fuel systems

Tasks: Explain terms, fundamental principles, components and functions of carburetor fuel systems

Use special tools and equipment

Use repair and service manuals

Differentiate between different carburetor systems

Adjust the carburetor

Demonstrate how to troubleshoot fuel systems

Remove, check/replace:

a. air cleaner element
b. fuel filter element
c. fuel pump
d. heat riser

(A) Rebuild the carburetor and install and adjust on vehicle

Competency: Service fuel-injection systems

Tasks: Explain terms, fundamental principles, components and functions of fuel-injection systems

Use special tools and equipment

Use repair and service manuals

Troubleshoot fuel-injection systems including:

a. diesel
b. gas
c. throttle-body
d. air induction systems
e. multi-point injection systems

Service, check/replace:

a. fuel filters
b. injectors
c. injector lines
d. fuel injection pump
e. primary pump
f. fuel injection computer

(A) Test and overhaul cam-operated in-line plunger-type pump and governor

(A) Test and overhaul rotary distributor pump and governor

(A) Time and reinstall injector pump

Competency: Service air induction systems

Tasks: Explain terms and fundamental principles of air induction systems

Identify types of air induction systems including:

a. naturally-aspirated
b. turbo-charging
c. supercharging

Use special tools

Use repair and service manuals

(A) Explain and demonstrate how to:

a. troubleshoot air induction systems
b. remove/replace induction unit
c. check and service:
   1. waste gate
   2. lubrication/cooling system
   3. drive/train system
   4. turbo-boost control
   5. intercooler
   6. intake air temperature control system

Competency: Service exhaust and emission systems

Tasks: Explain terms and fundamental principles associated with exhaust and emission systems

Use special tools and equipment

Use repair and service manuals

Discuss exhaust and emission environmental standards

Troubleshoot and service exhaust and emission systems including:

a. system leaks
b. stuck EGR and heat riser valves
c. exhaust obstructions
d. catalytic converter
e. PCV
f. evaporative emission control systems

Competency: Service ignition systems

Tasks: Explain terms, fundamental principles, components and functions of ignition systems including:

a. primary and secondary circuits
b. distributor components
c. firing order and timing
d. dwell and point gap
e. spark plugs
f. advance mechanisms
g. glow plug system (diesel)

Use special tools and equipment

Use repair and service manuals

Troubleshoot ignition systems

Replace/adjust to manufacturers specifications ignition components

Explain the operation of electronic and computerized ignition systems

(A) Troubleshoot and service electronic and computerized ignition systems using appropriate equipment such as:

a. analyzers
b. ignition testing equipment

Competency: Service inboard marine engines

Tasks: Explain terms, fundamental principles, components and functions of inboard marine engines

Identify differences between automotive and inboard marine engines such as:

a. manifolds and air filtering systems
b. raw water versus fresh water cooling and circulating systems
c. component parts--freeze plugs, special impellers and zincs
d. clockwise and counterclockwise rotating engines

Use special tools and equipment

Use repair and service manuals

Explain the use of special safety components required by government agencies (ie. Coast Guard, BIA, EPA)

Troubleshoot inboard marine engines

(A) Competency: Rebuild engines

Tasks: Explain terms and fundamental principles associated with rebuilding engines

Use special tools and equipment such as:

a. hone
b. hot tank
c. bead plasters
d. magna-fluxing equipment
e. groove cleaners
f. head service tools and equipment
g. boring bar
h. milling machine
i. hydraulic press
j. cambearing tool
k. ring compressors

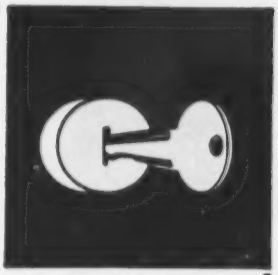
Use repair and overhaul manuals

Measuring engine components and replacing parts per manufacturers set standards

Demonstrate:

a. engine disassembly and assembly procedures and techniques
b. how to adjust, install and start-up rebuilt engines
c. break-in procedures and after-adjustments

Electrical Systems



(A) Indicates Advanced Competency or Task

Competency: Work safely

Tasks: Explain and demonstrate safety procedures for working with automobile electrical systems including the use of:

a. appropriate clothing
b. eye protection
c. special tools and equipment

Explain the importance of adhering to U.S. Coast Guard regulations relating to marine electrical applications

Competency: Service starting systems

Tasks: Explain terms and fundamental principles of electrical starting systems including:

a. Ohms Law
b. magnetism
c. current flows

Use special tools and equipment

Use service and repair manuals for wiring diagrams, schematics, and specifications

Test and service:

a. battery
b. starter motor, switch, and relay

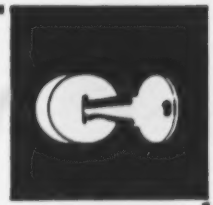
Remove, repair/replace the starter

(A) Rebuild the starter and bench test

Competency: Service charging systems

Tasks: Explain terms and fundamental principles of charging systems including:

a. Ohms Law
b. magnetism
c. current flows



Use special tools and equipment

Use repair and service manuals

Test and service:

a. alternator
b. voltage regulator
c. battery charger

Remove, replace/repair the alternator

(A) Rebuild the alternator and bench test

Competency: Service electrical accessories

Tasks: Explain terms and fundamental principles of electrical accessories

Use special tools and equipment

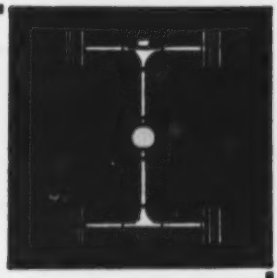
Use service and repair manuals

Test, service/replace:

a. circuits--wiring and printed
b. headlights and horn
c. turn signals and emergency flashers
d. fiber optic monitor systems
e. instrumentation and courtesy lights
f. interior and exterior electrical accessories
g. fuses, fuse links, and circuit breakers

(A) Diagnose, troubleshoot and service electronic components using advanced electronic analyzing equipment

Automotive Transmissions & Drive Trains



(A) Indicates Advanced Competency or Task

Competency: **Work safely**

Tasks: Explain and demonstrate safety procedures for working with automotive transmissions and drive trains including the use of:

a. hoists and lifts
b. jacks and jack stands
c. transmission jacks
d. test equipment
e. service and repair manuals

Competency: **Service manual transmissions, clutches, and differentials**

Tasks: Explain transmission terms, fundamental principles, components and their functions

Explain clutch terms, fundamental principles, components and their functions

Explain differential terms, fundamental principles, components and their functions

Use special tools and equipment

Use service and repair manuals

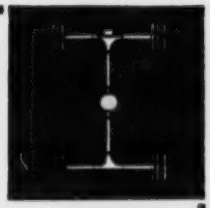
Service and adjust/replace:

a. clutch assembly
b. linkage
c. transmission/transfer case
d. driveline, universal joints, and constant velocity universal joints
e. differential
f. lubricant levels and condition

(A) Overhaul/rebuild:

a. manual transmissions
b. transfer cases
c. differentials
d. overdrive units

Competency: **Service automatic transmissions**



Tasks: Explain automatic transmission terms, fundamental principles, components and their functions

Use service and repair manuals

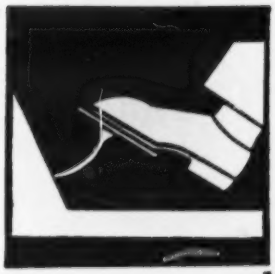
Use special tools and equipment

Service, adjust/replace:

a. fluid levels and conditions
b. linkage controls
c. transmission

(A) Rebuild and test automatic transmissions for domestic and foreign vehicles including testing and checking all hydraulic systems

Brakes



(A) Indicates Advanced Competency or Task

Competency: **Work safely**

Tasks: Explain and demonstrate safety procedures for working with brakes including:

a. asbestos containment equipment
b. bumper jacks
c. floor jacks
d. hoists and lifts

Discuss importance of legal aspects and liability concerns relating to brake systems service

Competency: **Service brake systems**

Tasks: Explain brake system terms, fundamental principles, components and their functions including:

a. drum
b. disk
c. hydraulic
d. mechanical
e. air
f. power-assist systems
g. dual brake systems
h. anti-skid braking systems
i. electronic demand-controlled system

Use service and repair manuals

Use special tools and equipment

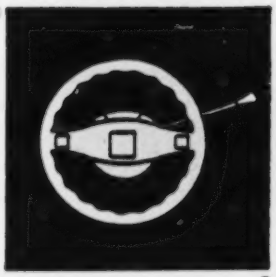
Identify braking system diagnosis/repair terms and techniques

Service, replace/adjust:

a. fluid levels
b. brake adjustments
c. disk brakes
d. drum brakes
e. hydraulic components/lines
f. flushing, filling, and bleeding hydraulic systems
g. wheel bearings

(A) Troubleshoot and service/rebuild advanced brake systems

Suspension, Steering & Alignment



(A) Indicates Advanced Competency or Task

Competency: Work safely

Tasks: Explain and demonstrate safety procedures for working with suspension, steering and alignment including:

a. spring tension release and containment
b. tire balancing equipment
c. tire inflation hazards

Discuss the importance of legal aspects and liability concerns relating to suspension, steering and alignment work

Competency: Service suspension systems

Tasks: Explain terms, fundamental principles, components and functions of suspension systems including:

a. independent suspension
b. McPherson struts
c. rigid axle
d. leaf spring suspension
e. air suspension
f. torsion bar
g. hydraulic suspension
h. automatic level control
i. stabilizer bars

Explain suspension systems diagnosis/repair terms and techniques

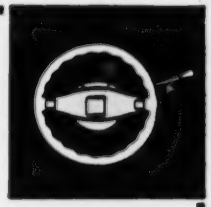
Use service and repair manuals

Use special tools and equipment

Compare shock absorber and spring systems

Service, replace/adjust:

a. coil spring
b. ball joints
c. McPherson struts
d. shock absorbers
e. load leveling suspension systems
f. hydraulic suspension systems



(A) Diagnose, troubleshoot and rebuild suspension systems

Competency: Service steering and alignment systems

Tasks: Explain steering and alignment systems terms, fundamental principles, components and their functions including:

a. manual steering systems
b. power assist steering systems
c. steering linkage systems

Explain front end geometry and tire weave relationships

Use service and repair manuals

Use special tools and equipment including:

a. alignment equipment
b. tire balancing equipment

Compare steering and alignment systems

Service, replace/adjust:

a. wheel bearings
b. caster/camber/toe-in
c. steering gear box
d. steering linkage components
e. lubrication of system
f. hydraulic steering systems including fluid levels
g. tires including rotation and inspection
h. wheel balancing--dynamic and static
i. two-way and four-way alignment

(A) Diagnose, troubleshoot and service advanced suspension, steering, and alignment systems

Accessories

Competency: Work safely

Tasks: Explain and demonstrate safety procedures for working with accessories

Discuss the importance of adhering to federal, state and local regulations concerning accessories

Competency: Service mechanical accessories

Tasks: Explain mechanical accessory terms, fundamental principles, components and functions including:

a. windshield wiper systems
b. seat belts
c. seat adjustment mechanisms
d. door/hood/trunk latching mechanisms
e. body sealing components
f. heating and air conditioning systems
g. remote control mirror adjustments

Use repair and service manuals

Use special tools and equipment

Troubleshoot, service, adjust/replace mechanical accessories to eliminate squeaks, leaks, rattles, and related problems

Climatic Care

Competency: **Climatize engine systems**

Tasks: Explain terms and fundamental principles for climatizing (winterizing/ summerizing) automotive and marine engine systems including:

a. cooling system
b. lubrication system
c. ignition system
d. fuel system
e. electrical system

Explain how coastal and interior climates affect engine systems including:

a. heater hoses
b. fan belts
c. other rubber and plastic/vinyl products
d. fluids

Use special tools and equipment

Use service and repair manuals

Service systems to conform to temperature conditions

Competency: **Climatize chassis systems**

Tasks: Explain terms and fundamental principles for climatizing (winterizing/ summerizing) automotive chassis systems relating to:

a. tires
b. door gaskets and locks
c. windshield wiper/washer system
d. power train lubricants
e. exhaust system leaks
f. carbon monoxide poisoning
g. rubber, plastic and vinyl products
h. other climate-related accessories and mechanisms

Explain how coastal and interior climates affect chassis systems

Use service manuals

Use special tools and equipment

Service systems to conform to temperature conditions

IV
Course Descriptions

Course Descriptions

The brief course descriptions provide conceptual frameworks for educational planners that seek to design and implement a balanced program in engine and vehicle mechanics. Teachers can use these descriptions to organize course offerings in engine and vehicle mechanics education. These descriptions are examples of content organization and are too brief for purposes of program approval. Local schools will need to be much more definitive regarding the content of their courses than is reflected in these course descriptions.

Course: Engine and Vehicle Mechanics I
Length: One Year
Grades: 9-12

Engine and Vehicle Mechanics I is a course which provides students with introductory experiences and basic skills in engine and vehicle technology. This first course includes an introduction to: laboratory safety, tools and laboratory equipment, basic engine fundamentals, employability skills, automotive engine service, electrical systems, automotive transmissions and drive trains, suspension, steering and alignment, accessories, and climatic care of automotive and marine systems.

Course: Engine and Vehicle Mechanics II
Length: One Year
Grades: 10-12

Engine and Vehicle Mechanics II is a course which provides students with intermediate level skills in all units taught in the introductory course. These units cover: laboratory safety, tools and laboratory equipment, basic engine fundamentals, employability skills, automotive engine service, electrical systems, automotive transmissions and drive trains, suspension, steering and alignment, accessories, and climatic care of automotive and marine systems. Only those students who have successfully completed Engine and Vehicle Mechanics I should be enrolled.

Course: Engine and Vehicle Mechanics III
Length: One Year
Grades: 11-12

Engine and Vehicle Mechanics III provides students with advanced level training in: laboratory safety, tools and laboratory equipment, basic engine fundamentals, employability skills, automotive engine service, electrical systems, automotive transmissions and drive trains, suspension, steering and alignment, accessories, and climatic care of automotive and marine systems. Only those students who have successfully completed Engine and Vehicle Mechanics I and II should be enrolled.

Course: Engine and Vehicle Mechanics IV
Length: One Year
Grades: 12

Engine and Vehicle Mechanics IV covers all of the skills required for entry-level engine and vehicle mechanics occupations. This is a course which provides students with mastery level skills in: laboratory safety, tools and laboratory equipment, basic engine fundamentals, employability skills, automotive engine service, electrical systems, automotive transmissions and drive trains, suspension, steering and alignment, accessories, and climatic care of automotive and marine systems. Only those students who have successfully completed Engine and Vehicle Mechanics I, II, and III should be enrolled in this senior-level mechanics course.

V
Curriculum Analysis Matrices

Curriculum Analysis Matrices

Identified Competencies by Course Offerings

This competency checklist should be used by teachers in identifying competencies to be included in specific classes in engine and vehicle mechanics education. This checklist is a curriculum analysis tool for use by teachers in assigning responsibilities for the competencies of a total engine and vehicle mechanics education program.

All courses taught in the engine and vehicle mechanics education program are identified in the columns at the top of the matrix. The individual competencies can be allocated to specific courses. One method for analyzing the competency list is to assign letters where the competency will be introduced (I), taught (T), or mastered (M). Curriculum sequences can be organized through this approach.

To assist mechanics teachers to reinforce basic skills instruction, competencies have been cross-referenced with the following academic areas:

Math (M)	Science (S)
Social Studies (SS)	Language Arts (LA)

This will assist local school districts in awarding cross-credit (academic credit) for participation in vocational classes they deem appropriate.

The following checklists are also cross-referenced with the Job Training Partnership Act pre-employment competencies and student leadership competencies. The Job Training Partnership Act provides funds to train economically disadvantaged youth to enter and succeed in employment. Each Private Industry Council responsible for administering these funds adopted youth pre-employment competencies as one of the measures for positive termination for program participants. The other measures are attained through unsubsidized employment, or through another training program.

The following categories of work-related knowledge must be evaluated and measured in the course of a participant's enrollment in a JTPA program:

1. Pre-Employment Competencies, which require the participant to demonstrate the skills and knowledge necessary to identify career objectives, seek and obtain employment and understand job performance.

2. Work Maturity Competencies, which require the participant to demonstrate the ability to apply skills in a training position.

3. Educational Skills Competencies, which require the participant to demonstrate basic computation and communication skills necessary to enter the labor market.

4. Occupational Skills Competencies, which require the participant demonstrate proficiency in those skills necessary to maintain employment in a specific occupation or occupational cluster.

The pre-employment and work maturity competencies have been specifically cross-referenced in this curriculum so that engine and vehicle mechanics instructors could specify where these competencies are integrated into the curriculum.

Student leadership programs are designed to be an integral part of the curriculum. The competencies are reinforced by student participation in approved student organizations such as Vocational Industrial Clubs of America. The student leadership competencies have been cross-referenced in this handbook to assist the engine and vehicle mechanics instructor in identifying specifically where these competencies will be taught.

VOCATIONAL INDUSTRIAL CLUBS OF AMERICA (VICA)

Vocational Industrial Clubs of America (VICA) is for students enrolled in secondary and postsecondary vocational courses in trade, industrial, technical and health education.

Through planned club activities, VICA develops the "whole" student, social and leadership abilities as well as vocational skills. The VICA motto is "Preparing for Leadership in the World of Work." VICA goals include:

- Foster an understanding of the functions of labor and management organizations and a recognition of their interdependence.
- Foster respect for the dignity of work.
- Relate school experiences to a young person's search for meaning, identity and achievement.
- Teach young people how to live and work with others...to accept and be accepted.
- Offer activities that complement occupational skill development.
- Create interest in and stimulate favorable community response to trade, industrial, technical and health occupations education.
- Promote high standards in work ethics, craftsmanship, scholarship and safety.
- Help students understand their roles in a technological age.

Alaska VICA, chartered in 1973, serves about 140 members in 10 chapters. The national organization is located in Leesburg, Virginia.

KEY

M Math
S Science
LA Language Arts
SS Social Studies
***** Pre-Employment Competencies
+ Student Leadership Competencies

Recommended Competencies by Course Offerings Competencies		Engine & Vehicle Mechanics I	Engine & Vehicle Mechanics II	Engine & Vehicle Mechanics III	Engine & Vehicle Mechanics IV		
	Laboratory Safety						
S LA	Understand the organization of the laboratory						
S LA	Use safety procedures						
M S LA	Use hazardous chemicals safely						
M S LA	Report faulty laboratory equipment						
M S LA	Maintain a clean shop						
S LA SS	Follow OSHA guidelines						
S LA	Prevent work-related injuries						
	Tools and Laboratory Equipment						

Recommended Competencies by Course Offerings Competencies		Engine & Vehicle Mechanics I	Engine & Vehicle Mechanics II	Engine & Vehicle Mechanics III	Engine & Vehicle Mechanics IV		
M S	Use hand tools						
M S	Use metric measurements						
M S	Use measuring devices						
M S	Use power tools						
M S	Operate oxy-acetylene equipment						
M S	Use fasteners, gaskets, and sealants						
	Basic Engine Fundamentals						
S LA SS	Understand combustion engine development						
S	Classify engines						

Recommended Competencies by Course Offerings Competencies		Engine & Vehicle Mechanics I	Engine & Vehicle Mechanics II	Engine & Vehicle Mechanics III	Engine & Vehicle Mechanics IV		
M S	Understand engine construction and components						
M S	Identify engine drive train components						
S LA	Understand engine operating systems						
M S LA	Understand engine measurement and performance						
S SS	Identify engine applications						
	Employability Skills						
* + LA	Identify career choices						
* + LA SS	Identify jobs in the engine and vehicle mechanics industry						
* + LA	Prepare a resume and job application						

Recommended Competencies by Course Offerings Competencies		Engine & Vehicle Mechanics I	Engine & Vehicle Mechanics II	Engine & Vehicle Mechanics III	Engine & Vehicle Mechanics IV		
* + LA	Write a cover letter						
* + LA	Prepare for an interview						
* LA	Follow up the interview						
*	Identify personal responsibilities related to employment						
* S	Maintain good health for effective job performance						
* +	Identify employee rights and responsibilities						
* + LA	Apply reading and writing skills						
* LA	Deal effectively with customers						
* +	Demonstrate work maturity						

Recommended Competencies by Course Offerings Competencies		Engine & Vehicle Mechanics I	Engine & Vehicle Mechanics II	Engine & Vehicle Mechanics III	Engine & Vehicle Mechanics IV		
* + LA	Solve problems						
* +	Demonstrate initiative and productivity						
* +	Be assertive						
* +	Be honest						
* +	Be reliable and dependable						
* +	Maintain good personal relations						
* + LA	Follow verbal and writtten directions						
* LA	Identify proper job termination procedures						
* +	Use effective leadership skills						

Recommended Competencies by Course Offerings Competencies		Engine & Vehicle Mechanics I	Engine & Vehicle Mechanics II	Engine & Vehicle Mechanics III	Engine & Vehicle Mechanics IV		
LA SS	Understand how to be an entrepreneur						
	Automotive Engine Service						
M S LA SS	Apply principles of service and maintenance						
M S LA	Use service and repair manuals						
M S LA	Perform routine automotive maintenance						
M S LA	Service lubrication systems						
M S LA	Service cooling systems						
M S LA	Service carburetor fuel systems						
M S LA	Service fuel-injection systems						

Recommended Competencies by Course Offerings Competencies		Engine & Vehicle Mechanics I	Engine & Vehicle Mechanics II	Engine & Vehicle Mechanics III	Engine & Vehicle Mechanics IV		
M S LA	Service air induction systems						
M S LA SS	Service exhaust and emission systems						
M S LA	Service ignition systems						
M S LA SS	Service inboard marine engines						
M S LA	Rebuild engines						
	Electrical Systems						
M S LA SS	Work safely						
M S LA SS	Service starting systems						
M S LA	Service charging systems						

Recommended Competencies by Course Offerings Competencies		Engine & Vehicle Mechanics I	Engine & Vehicle Mechanics II	Engine & Vehicle Mechanics III	Engine & Vehicle Mechanics IV		
M S LA SS	Service electrical accessories						
	Automotive Transmissions and Drive Trains						
M S LA	Work safely						
M S LA	Service manual transmissions, clutches, and differentials						
M S LA	Service automatic transmissions						
	Brakes						
S LA SS	Work safely						
M S LA	Service brake systems						
	Suspension, Steering & Alignment						

Recommended Competencies by Course Offerings Competencies		Engine & Vehicle Mechanics I	Engine & Vehicle Mechanics II	Engine & Vehicle Mechanics III	Engine & Vehicle Mechanics IV		
S LA SS	Work safely						
M S LA	Service suspension systems						
M S LA	Service steering and alignment systems						
	Accessories						
M LA SS	Work safely						
M S LA	Service mechanical accessories						
	Climatic Care						
M S LA	Climatize engine systems						
M S LA	Climatize chassis systems						

VI
Sample
Skills Card

Sample Skills Card

This section of the guide provides teachers with an example of an instrument for evaluating the effectiveness of instruction. The skills record allows teachers to assess competency at four levels of proficiency. Teachers are encouraged to construct their own skills performance record using the competency lists in the curriculum section of this guide.

Instructions for Use

The list of vocational skills/traits was developed from a task analysis of an engine and vehicle mechanics competency.

Level	Code Key
1	Introductory Level: Can do simple parts of task. Needs to be told/shown how to do most of the task. Needs extremely close supervision.
2	Minimum Level: Can do most parts of the task. Needs help only with most difficult parts. Needs close supervision.
3	Average Level: Can do all parts of task. Needs only spot-check of completed work. Meets local demands for speed and accuracy. Needs moderate job entry supervision.
4	Proficiency Level: Can complete task quickly and accurately. Can direct others in how to do the task. Needs little supervision.

Directions: The instructor/employer may write, date and initial in appropriate square.

Use metric measurements

1	2	3	4

Explain basic metric measurements such as meters liters and kilos

Convert conventional measurement units to metric such as:

a. yard to meter
b. inch to centimeter
c. mile to kilometer
d. quart to liter
e. inch to millimeter

Comments:

VII
Suggested Resources

Suggested Resources

This section identifies specific resources and sources for finding instructional materials and supplies for engine and vehicle mechanics.

The following source lists have been characterized by media type to facilitate teacher use: resource libraries, publishers of texts and instructional materials, state resources, associations, periodicals, special books/pamphlets, media, and materials suppliers. A tools and specialized shop tools and equipment list, copied from the *Tools and Equipment Manual for NATEF Automobile Technician Training Certification Program* of the National Institute for Automotive Service Excellence, is also included.

The Alaska Department of Education has not formally reviewed nor approved all the resources listed in this section. Teachers are encouraged to preview materials before using them in the classroom.

Resource Libraries

Alaska Vocational Materials Library
Office of Adult & Vocational Education
Alaska State Department of Education
Box F
Juneau, AK 99811
(907) 465-2980

- Alaska Energy Education Series
- Appropriate Technology for Alaskans
- Basic Skills For The Trades
- Choices & Challenges: A Young Man's and Teen Woman's Journal for Self-Awareness and Personal Planning
- Cooperative Education and On-The-Job Training Handbook
- Home-Based Business Resources
- Industrial Education Curriculum
- Industrial Education Resources
- Local Advisory Committee: Handbook for Vocational Administrators
- Pre-Employment Competencies Resource Guide
- Safety and School Shop Planning
- STARS: Secondary Training For Alaska
- Vocational Education Administration Handbook

The Library maintains curricula for all vocational areas. Resources are loaned for a 2 month review period. There are also many materials which may be purchased from the Library's special collections. Some materials are available free of charge.

The Library's catalog is computerized and may be operated on an Apple Computer using Appleworks Software. The catalog may be obtained by sending $10.00 (please make your check payable to the South East Regional Resource Center) or by sending five blank disks for duplication.

Alaska Career Information System
Office of Adult and Vocational Education
Alaska Department of Education
Box F
Juneau, AK 99811
(907) 465-2980

- Comprehensive career guidance system developed by Alaskans and for Alaskans seeking occupational and educational opportunities in and out of Alaska.

Alaska Health Sciences Library
3211 Providence Dr.
Anchorage, AK
(907) 786-1870

- Journals and magazines in the area of job safety and health

Alaska State Film Library
650 W International Airport Road
Anchorage, AK 99518
(907) 561-1132

- Films on Automobile Repair and Maintenance
- Last Chance Garage Video Series

Northwestern Vocational Curriculum Coordination Center
St. Martin's College
Lacey, WA 98503

- 10-state regional library of vocational materials. Can be accessed through the Alaska Vocational Materials Library.

National Center for Research in Vocational Education
The Ohio State University
1960 Kenny Road
Columbus, OH 43210

- Vocational Education Curriculum Materials database of all 50 states. Can be accessed through the Alaska Vocational Materials Library.
- Catalog of materials available on new technology in vocational-technical education.

Publishers

American Technical Publishers, Inc.
12235 South Laramie Ave.
Alsip, IL 60658

Bobbs-Merrill Publishing Co.
4300 W 62 St.
P.O. Box 7080
Indianapolis, IN 46206

Briggs and Stratton Engine Corporation
2711 North 13 St.
Milwaukee, WI

Chief Automotive Systems
1924 E 4th St. Box 1368
Grand Island, NE 68802

Chilton Book Co.
Chilton Way
Radnor, PA 19089

Clymer Publications
P.O. Box 4520
Arleta, CA 91333

Dana Corporation
School Assistance
Box 453
Toledo, OH 43692

Goodheart-Wilcox Co., Inc.
123 W Taft Dr.
South Holland, IL 60473

Gregg Division/McGraw-Hill Book Co.
Western Regional Office
8171 Redwood Highway
Novato, CA 94947
(415) 897-5298

Intertec Publishing Corp
Box 12901
Overland Park, KS 66212
(913) 888-4664

Mitchell Information Services, Inc.
9889 Willow Creek Rd.
Box 26260
San Diego, CA 92126

National Textbook Company
4255 W. Touhy Ave.
Lincolnwood, IL 60646

Prakken Publications
P.O. Box 8623
Ann Arbor, MI 48107

Prentice-Hall Publishing Co.
Educational Books Division
Englewood Cliffs, NJ 07632

Deere and Co.
John Deere Road
Moline, IL 61265

Delmar Publishers
2 Computer Dr. West
Albany, NY 12212

Glencoe Publishing Co.
17337 Ventura Blvd.
Encino, CA 91316

South-Western Publishing Co.
5101 Madison Rd.
Cincinnati, OH 45227

Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402

State Resources

Alaska Department of Labor
Occupational Safety and Health
3301 Eagle St.
P.O. Box 7-022
Anchorage, AK 99501

- Provides free information, training and inspections

Curriculum and Instructional Materials
Center (CIMC)
1500 W Seventh Ave.
Stillwater, OK 74074

- Auto Mechanics I & II
- Highway Maintenence Equipment Operator

Curriculum Development Unit
Office of Vocational Education
2024 Capital Plaza Tower
Frankfort, KY 40601
(502) 564-2890

- Instructional modules on auto mechanics

Curriculum Publications Clearinghouse
Western Illinois University
Horrabin Hall Y6
Macomb, IL 61455
(309) 298-1917

- Microcomputer Applications in Vocational Education: Trades and Industry
- Vocational-Technical Education Consortium of States (V-TECS) catalogs of performance objectives and curriculum guides for mechanics

Educational Instructional Materials Center
University of Texas at Austin
P.O. Box 7218
Austin, TX 78713-7218
(512) 471-7716

- Automotive Air Conditioning Mechanic
- Automotive Mechanic: Fundamentals
- Automotive Mechanic: Service and Repair
- Automotive Parts Clerk
- Brake and Wheel Alignment Mechanic
- Competency Profiles for Automotive Areas

Instructional Materials
Trade and Industrial Education
202-B Skyland Blvd.
Tuscaloosa, AL 35405
(205) 759-5448

- Automotive Mechanics

Instructional Materials Laboratory
10 Industrial Education Building
University of Missouri-Columbia
Columbia, MO 65211
(314) 882-2883

- Auto Mechanics Series
- Auto Service-Special Needs Curriculum
- Auto-Service-Vocabulary Module

Instructional Materials Service
Trade and Industrial Education
Texas A&M University
FE Box 2588
College Station, TX 77843-2588
(409) 845-6601

- Auto Mechanics

Kansas Vocational Curriculum Dissemination Center
Pittsburg State University
Pittsburg, KS 66762
(316) 231-7000

- Auto Mechanics I & II

The Media Center
State Fair Community College
1906 Clarendon Rd.
Sedalia, MO 65301
(816) 826-7100

- Instructional modules including student and teacher guides, slide-tape or video presentations on auto mechanics

Michigan Vocational Education Resource Center
133 Erickson Hall
Michigan State University
East Lansing, MI 48824
(517) 353-4397

- Auto Mechanics Curriculum

Mid-America Vocational Curriculum Consortium (MAVCC)
1500 W Seventh Ave.
Stillwater, OK 74074
(405) 377-2000

- Automotive Emission Control
- Braking Systems
- Comprehensive Small Engine Repair
- Outboard Repair
- Parts Specialist
- Snowmobile Repair

Minnesota Curriculum Services Center
3554 White Bear Ave.
White Bear Lake, MN 55110
(612) 770-3943

- A Course on Alcohol Fuels
- Teaching Aids and Competency-Based Education Modules for Automotive Trades

Occupational Curriculum Laboratory
East Texas State University
Commerce, TX 75428
(214) 886-5624

- General Mechanical Repair: Minor Automotive Maintenance

Oregon Career Development Consortium
Marion Education Service District
651 High St. NE Suite 4
Salem, OR 97301
(503) 378-7470

- Basic Skills in Vocational Education: Computer Skills, Mathematics, Reading, Speaking/ Listening, Writing

Portland State University
Division of Continuing Education
P.O. Box 1491
Portland, OR 97207
(503) 229-4800

- Individualized learning systems for auto mechanics and hydraulics

Superintendent of Public Instruction
Office of Trade, Industrial, Technical and Health Occupations
Division of Vocational/Technical Education
Old Capitol building, MS FG111
Olympia, WA
(206) 753-5675

- Student Learning Objectives for Auto Mechanics

Vocational Curriculum Development and Research Center
P.O. Box 1159
Natchitoches, LA 71458-1159
(318) 352-5348

- Auto Mechanics

Associations

American Association for Vocational Instructional Materials (AAVIM)
120 Driftmeir Engineering Center
Athens, GA 30602
(404) 542-2586

- Assisting Students in Improving Their Basic Skills
- ATV Maintenance Manual
- Care and Operation of Small Gasoline Engines
- Developing Shop Safety
- Electric Motors
- Fuels and Lubricants
- Inboard/Outboard Service
- Small Gas Engine Part Identification

American Automobile Association 8111 Gatehouse Road Falls Church, VA 22042 (703) 222-6000	• Maintains library on travel, transportation, safety and business
American Gear Manufacturers Association 1500 King St., Suite 201 Alexandria, VA 22314 (703) 684-0211	• AGMA Standards • Monthly News Digest
American National Standards Institute 1430 Broadway New York, NY 10018 (212) 354-3300	• American National Standard for Training of Automotive Mechanics for Passenger Cars and Light Trucks • Catalog of Standards
American Petroleum Institute 1220 L St. NW Washington, DC 20005	• How To Sell Motor Oil • Motor Oil Guide
American Society of Lubrication Engineers 838 Busse Highway Park Ridge, IL 60068 (312) 825-5536	• Lubrication Engineering • ASLE Transactions
American Society for Testing and Materials 655 15 St. NW Washington, DC 20005 (202) 639-4025	• Book of ASTM Standards • Standardization News • Symposium on Lubricants for Automotive Equipment
American Technical Society 848 E 58th St. Chicago, IL 60637	• Automotive Fuel and Ignition Systems
American Vocational Association (AVA) 1410 King St. Alexandria, VA 22314	• Instructional Materials for Auto Repair
Automotive Engine Rebuilders Association 234 Waukegan Rd. Glenview, IL 60025 (312) 729-6400	• Camshaft Identification Guide • Cyclinder Head and Block Identification Guide • Shop Management Bulletin • Shop Procedure Bulletin • Technical Bulletin

Automotive Information Council 29200 Southfield Rd. #111 Southfield, MI 48076 (313) 559-5922	• Monthly Newsletter • Publishes consumer pamphlets and provides information on motor vehicle industry
Automotive Service Councils of America 188 Industrial Dr. Suite 112 Elmhurst, IL 60126 (312) 530-2330	• Automotive Service Reports
Automotive Service Industry Association 444 North Michigan Ave. Chicago, IL 60611 (312) 836-1300	• AEA Tune-Up Manual • Automotive Electric Systems • Automotive Fuel Systems • Automotive Service Job Opportunities • Technical Training Manual
Car Care Council 600 Renaissance Center Detroit, MI 48243	• Provides editorial and public service advertising materials which stress importance of proper vehicle maintenance
Engine Service Association, Inc. 710 N Plankinton Ave. Milwaukee, WI 53202 (414) 271-2263	• Provide vocational education services for those involved in sales and service of internal combustion engines and engine powered equipment
Instrument Society of America P.O. Box 12277 Research Triangle Park, NC 27709 (919) 549-8411	• Publications and Training Aids Catalog
Motor and Equipment Manufacturers Association 300 Sylvan Ave. Englewood Cliffs, NJ 07632 (201) 568-9500	• Autobody Supply and Equipment • Car Maintenance in the USA
Motor Vehicle Manufacturers Association 300 New Center Bldg. Detroit, MI 48202 (313) 872-4311	• Action Handbook for Automotive Service Instruction • Career Development Standards • Motor Vehicle Facts and Figures • Motor Vehicle Identification Manual

National Association of College Automotive Teachers (NACAT) Kent State University Trumbull Campus 4314 Mahoney Ave. NW Warren, OH 44483 (216) 847-0571	• Standards and resources
National Automotive Parts Association 2999 Circle 75 Pkwy Atlanta, GA 30339 (404) 956-2200	• Distributes automobile parts, accessories and supplies • Outlook
National Institute for Automotive Service Excellence (ASE) 1920 Association Dr. Reston, VA 22091 (703) 648-3838	• Conducts research to determine the best methods for training automotive technicians and encourages the development of effective training programs • Evaluation Guide for NATEF Automobile Technician Training Certification Program • Gear • Policies and Procedures for NATEF Automobile Technician Training Certification Program • The Blue Seal • Tools and Equipment Manual for NATEF Automobile Technician Training Certification Program
National Marine Manufacturers Association Boating Industry Association 401 N. Michigan Ave. Chicago, IL 60611 (312) 836-4747	• Publishes booklets on marinas, statistics, boating writer's information guide, boating laws and a film directory
National Occupational Testing Institute 318 Johnson Hall Ferris State College Big Rapids, MI 49302 (616) 796-4695	• Auto Mechanic: Scope of the Written and Performance Test
Society of Automotive Engineers 400 Commonwealth Dr. Warrendale, PA 15096 (412) 776-4841	• Air Cleaner Test Code • Combustion Chamber Deposition and Power Loss • Engine Varnish and Sludge • Handbook of Standards • SAE Quarterly Transactions • The Where and Why of Engine Reports

Tune-Up Manufacturers Institute
222 Cedar Lane
Teaneck, NJ 07666
(201) 836-9500

- Tune-Up Manual

Vocational Industrial Clubs of America
(VICA)
P.O. Box 3000
Leesburg, VA 22075

- Advisor Guide
- National Leadership Handbook

Periodicals

American Industrial Arts Association
1914 Association Dr.
Reston, VA 22091

- The Technology Teacher

American Vocational Association
1410 King St.
Alexandria, VA 22314

- Vocational Education Journal

Automotive Industries International
Chilton Way
Radnor, PA 19089

- Automotive Industries

Automotive Service Industry Association
444 N Michigan Ave.
Chicago, IL 60611
(312) 836-1300

- Voice of the Industry

Babcox Automotive Publications
11 South Forge Street
Akron, OH 44304

- Automotive Rebuilder
- Brake and Front End Service

Bond/Parkhurst Publications
1499 Monrovia Ave.
Newport Beach, CA 92663

- Road and Track

Chilton Co.
Chilton Way
Radnor, PA 19089

- Motor Age

Fawcett Publications
1515 Broadway
New York, NY 10036

- Mechanix Illustrated

George D. Slankard
114-120 Franklin Ave.
Sesser, IL 62884

- Cars and Parts

Hunter Publishing Co.
53 W Jackson St.
Chicago, IL 60606

- Motor Service

John A. Linkletter
Hearst Corporation
224 W 57th St.
New York, NY 10019

- Motor
- Popular Mechanics

Lopez Publications
21 W. 26th St.
New York, NY 10010

- Small Cars Magazine

McGraw-Hill Book Co.
Princeton Road
Hightstown, NJ 08520

- Automobile International

National Automobile Dealers Assoc.
2000 K St. NW
Washington, DC 20006

- Cars and Trucks

National Automotive Radiator Service Association
P.O. Box 267
Harleysville, PA 19438
(215) 256-4246

- Automotive Cooling Journal

Petersen Publishing Co.
8490 Sunset Blvd.
Los Angeles, CA 90069

- Car Craft
- Hot Rod
- Motor Trend

Prakken Publications
P.O. Box 8623
Ann Arbor, MI 48107

- School Shop

Society of Automotive Engineers
400 Commonwealth Dr.
Warrendale, PA 15096
(412) 776-4841

- Automotive Engineering

Ward's Communications
28 W Adams St.
Detroit, MI 48226

- Ward's Auto World

Special Books/Pamphlets

Champion Spark Plug Co.
900 Upton Ave.
Toledo, OH 43661
(419) 535-2567

- Facts About Spark Plugs and Engines

Chrysler Motors Corporation
Service Training
26001 Lawrence Ave.
Center Line, MI 48015

- Carburetion Facts and Fundamentals
- Carburetion Fundamentals
- Mechanical Information

Clymer Publications
12860 Muscatine St.
P.O. Box 20
Arleta, CA 91331

- Clymer's Honda ATC Repair Manuals

Cooperative Extension Service
University of Alaska
WWB-6 Bunnell Building
303 Tanana Dr.
Fairbanks, AK 99701
(907) 479-7268

- Getting Your Car Through an Alaskan Winter
- How to Dewinterize Your Car and Camper
- Small Engine Storage
- Winterizing Your Car and Camper

Ford Motor Co.
3000 Schaefer Rd.
Dearborn, MI 48121

- Automobile Mechanic Training Program Curriculum Outline
- Service Training Aids Catalog

General Motors Corporation
Public Relations Staff
General Motors Bldg.
Detroit, MI 48202

- Auto Mechanic
- Automobile Progress
- The ABC of Hand Tools
- The Automobile Story
- Transportation Progress

Howard Sams, Inc.
4300 W 62nd St.
P.O. Box 7080
Indianapolis, IN 46206

- Outboard Motors and Boating
- Small Gasoline Engines
- Small Gasoline Engine Repairman

Hearst Books Business Publishing Group 555 W. 57th St. New York, NY 10019	• Motor's Auto Repair Manual
HP Books PO Box 5367 Tucson, AZ 85703 (602) 888-2150	• How to Rebuild Your Small Block Chevy and other books
National Institute for Occupational Safety and Health Regional Office 321 Second Ave. Seattle, WA (206) 442-0530	• Research and technical assistance, information and publications for all areas of job safety and health
National Safety Council 444 North Michigan Ave. Chicago, IL 60611 (312) 527-4800	• Accident Prevention Program for School Shops • Safe Worker
Pacific Automotive Show PO Box 9288 Van Nuys, CA 91409-9288 (818) 376-0014	• Career Opportunities Unlimited brochure and other information
Pathfinder Publications, Inc. 108 Moss Ave. Boston, MA 02123	• The Incredible Illustrated Tool Book
Readers Digest Association, Inc. Pleasantville, NY	• Reader's Digest Complete Car Care Manual
Quaker State Oil Refining Corp. 255 Elm St. Oil City, PA 16301 (814) 676-7676	• Motor Oils and Engine Lubrication
S-A Design Books 515 West Lambert, Bldg E Brea, CA 92621	• Bolt-On Performance • Chevy Performance • Ford Performance • Holley Carburetors • Mopar Performance • Performance with Economy • Super Power

Tecumseh Products Co.
Ottawa and Patterson Streets
Tecumseh, MI 49286
(517) 423-8411

- Four Stroke Cycle Engine Mechanic's Handbook
- Mechanics Handbook: Light and Medium Frames

Theodore Audel and Co.
4300 W·62nd St.
Indianapolis, IN 46268

- Audel's Outboard Motors and Boating

Media

Bergwall Productions, Inc.
106 Charles Lindbergh Blvd.
Uniondale, NY 11553

Career Aids, Inc.
20417 Nordhoff St. Dept. D5
Chatsworth, CA 91311
(818) 341-8200

Color Film Corporation
Video Division
770 Connecticut Ave.
Norwalk, CT 06854
(203) 886-2711

Dana Corporation
Educational Assistance
P.O. Box 453
Toledo, OH 43692

DCA Educational Products
4685 Stenton Ave.
Philadelphia, PA 19144

Deere and Co., Inc.
John Deere Road
Moline, IL 61265

Meridian Education Corporation
608 E Locust St.
Bloomington, IL 61701
(309) 827-5455

National Audiovisual Center
National Archives and Records Administration
8700 Edgeworth Dr.
Capitol Heights, MD 20743
(301) 763-1896

National Innovative Media Co.
Route #2 Box 301 B
Calhoun, KY 42327
(502) 273-5050

Nationwide Computer and Video
P.O. Box 61E
1380 S. Pennsylvania Ave.
Morrisville, PA 19087
(215) 295-0055

Pictures, Inc.
811 W. 8th Ave.
Anchorage, AK 99501
(907) 279-1515

Teaching Aids, Inc.
P.O. Box 1798
Costa Mesa, CA 92628-0798

Education Associates, Inc.
P.O. Box Y
8 Crab Orchard Rd.
Frankfort, KY 40602
(502) 227-4783

Ford Service Division
3000 Schaefer Rd.
Dearborn, MI 48121

Hobar Publications
1234 Tiller Lane
St. Paul, MN 55112
(612) 633-3170

Loctite Corporation
Automotive and Consumer Group
705 N. Mountain Rd.
Newington, CT 06111
(203) 278-1280

Technovate, Inc.
910 SW 12th Ave.
Pompano Beach, FL 33060

TPC Training Systems
1301 S. Grove Ave.
P.O. Box 1030
Barrington, IL 60010
(312) 381-7015

U.S. Environmental Protection Agency
TSCA Assistance Office TS-799
401 M St. SW
Washington, DC 20460
(202) 554-1404

Vocational Media Associates
Prentice-Hall Media
Box 1050
Mt. Kisco, NY 10549

Materials Suppliers

Allen Test Products Division
2101 N Pitcher St.
Kalamazoo, MI 49007

Ammco Tools, Inc.
Wacker Park
North Chicago, IL 60064

Bacharach, Inc.
United Technologies
625 Alpha Dr.
Pittsburgh, PA 15238

Bear Automotive Service Equipment Co.
P.O. Box 25397
Milwaukee, WI 53225

Mac Tools, Inc.
P.O. Box 370
Washington Court House, OH 43160

Miller Special Tools
Division of Utica Tool Co., Inc.
32615 Park Lane
Garden City, MI 48135

Nilfisk of America
300 Technology Dr.
Malvern, PA 19355

OTC Division
Sealed Power Corp.
906 Nixon St.
Owatonna, MN 55060

Bob Kerr's Marine Tool Co.
P.O. Box 1135
Winter Garden, FL 32787

Brodhead-Garrett Co.
4560 E 71st St
Cleveland, OH 44105
(800) 321-6730

Clayton Associates, Inc.
P.O. Box 589
30 Southard Ave.
Farmingdale, NJ 07727

Deere and Co.
John Deere Road
Moline, IL 61265

Eagle Manufacturing Co.
24th and Charles St.
Wellsburg, WV 26070

FMC Corporation
Auto Service Equipment Division
Industrial Park
Conway, AR 72032

Ken Cook Education Systems
12855 West Silver Spring Dr.
Butler, WI 53007

Kleer-Flo Co.
15151 Technology Dr.
Eden Prairie, MN 55344

Northwest Sales Group
5718 1st Ave. S.
Seattle, WA 98108
(206) 762-5111

Paxton/Patterson
5719 W 65th St.
Chicago, IL 60638

Rotary Lift
A Dover Industries Company
P.O. Box 30205, Airport Station
Memphis, TN 38130

Satco, Division of Saterlee
924 S 19th Ave.
Minneapolis, MN 55404

Sears Contract Sales
Sears Roebuck and Co.
19th Floor, Sears Tower
Chicago, IL 60684

S-T Industries, Inc.
301 Armstrong Blvd.
St. James, MN 56081

Sun Electric Corp.
One Sun Parkway
Crystal Lake, IL 60014

Wear Corporation
PO Box 80312
Seattle, WA 98108
(206) 251-6000

ZEP Manufacturing Co.
18417 Cascade Ave. S.
Seattle, WA 98188
(206) 248-1900

Zip-Penn
3633 Seaport Blvd
P.O. Box 15129
Sacramento, CA 95851
(916) 372-7410

Tools List

Suggested basic hand tool set needed by students for employment as an entry-level Automobile Technician (copied from the *Tools and Equipment Manual for NATEF Automobile Technician Training Certification Program* by the National Institute for Automotive Service Excellence).

Adjustable Wrench - 10"

Battery Tools -- Battery Nut Pliers
Battery Terminal Clamp Puller
Battery Post Cleaner

Belt Tension Gauge

Blow Gun -- Rubber Tip (OSHA approved)

Brake Spoon

Chisel -- 5/8" Cold Chisel
5/16" Cape Chisel

Combination Wrenches --7/16" - 1"
7mm - 19mm

Creeper

Filter Wrench -- Oil and Gas

Files -- 10" Coarse
6" Fine

Hack Saw

Hammers -- Medium Ball Peen
Soft Face

Magnetic Pickup Tool

Mechanics Steel Ruler

Oil Can -- Pump Type

Pliers -- Needle Nose
All purpose
Hose Clamp
Side Cutters
Vise Grip
Slip Joint (water pump)

Punches -- 1/4" and 1/8" pin punch, 3/8" taper punch
3" center punch

Safety Glasses

Scraper -- 1 1/2" wide

Screwdriver: Common -- stubby, 6", 12", 9" offset
Phillips -- stubby #1, #2
6", #1, #2
12", #3
offset #2
Torx -- T-15, T-20, T-25, T-30

Screw Pitch Gauge -- N.F., N.C., Metric

Screw Starter -- Standard and Phillips

Socket Set 3/8" Drive -- 5/16" thru 3/4" standard (6 pt)
3/8" thru 3/4" deep (6 pt)
6mm to 19mm
9mm to 19mm deep
universal joint
ratchet handle
short, medium and long extension
spark plug sockets - 5/8" and 13/16"
speed handle
breaker bar

Spark Plug Gap Gauge

Spark Plug Wire Remover

Tape Measure

Thread Chaser Set

Tire Pressure Gauge

Tool Box

Torque Wrench 3/8" drive - 5-75', 5-100mm

Wire Brush

Shop Tools and Equipment

The following is an overview of tools and equipment a shop should have for training in any given specialty area. All shops are assumed to have an air compressor, adequate electrical capacity, fender covers and steel work benches with vises (copied from the *Tools and Equipment Manual for NATEF Automobile Technician Training Certfication Program* by the National Institute for Automotive Service Excellence).

Front End

Arbor Press
Axle Stands
Bearing Packer, hand operated
Chassis Lubricator System
Floor Jacks, 4 ton
Hoist(s), Swing Arm Frame Contact
Hydraulic Press, 25 Ton
Oxy-Acetylene Welder
Parts Cleaning Tank
Tire Mounting Machine
Wheel Alignment Equipment, rack or pit type
Wheel Balancer, on car spin balancer and off car electronic type

Brakes

Arbor Press
Axle Stands
Bearing Packer, hand operated
Bench Grinder
Brake Bleeder, Pressure
Brake Shop, mobile with disc attachments
Dial Indicator
Floor Jack, 4 Ton
Hoist(s), Swing Arm Frame Contact
Hydraulic Press, 25 Ton
Oxy-Acetylene Welder
Parts Cleaning Tank
Puller(s)

Heating and Air Conditioning

Air Conditioner Repair Unit consisting of pullers, removers, adapters, special feeler gauges, tools, system analyser, hoses leak detector, circuit tester, thermometer ratchet, refrigerant can, dispenser valves and portable vacuum pump
Axle Stands
Bench Grinder
Cooling System Tester
Dial Indicator
Floor Jack
Gear Puller(s)
Hydraulic Press, 25 Ton
Oxy-Acetylene Welder
Thermostat Tester

Performance

Arbor Press
Axle Stands
Battery Charger
Battery/Starter Tester
Bench Grinder
Dial Indicator Set
Distributor Tester
Engine Analyzer with scope, etc.
Floor Jack, 4 Ton
Parts Cleaning Tank
Puller Set
Spark Plug Cleaner

Automatic Transmission/Transaxle

Arbor Press
Axle Stands
Bench Grinder
Floor Jack(s), 4 Ton
Hoist(s), Swing Arm Frame Contact
Hot Tank
Hydraulic Press, 25 Ton
Parts Cleaning Tank
Portable Crane, 2 Ton
Puller Sets
Transmission Jack(s)
Transmission Holding Fixtures
Transmission Special Tool Sets

Electrical Systems

Arbor Press
Armature Tester
Axle Stand(s)
Battery Charger
Battery/Starter Tester
Floor Jack(s), 4 Ton
Grinder
Hydraulic Press, 25 Ton
Parts Cleaning Tank
Puller Set
Volt-Ampere Tester
Wood (non-conductive) Work Bench

Manual Drive Train and Axles

Arbor Press
Arc Welder
Axle Stand(s)
Bench Grinder
Brake Bleeder
Dial Indicator Set
Floor Jack(s), 4 Ton
Hoist(s), Swing Arm Frame Contact
Holding Fixtures
Hot Tank
Hydraulic Press, 25 Ton
Lube Dispenser
Oxy-Acetylene Welder
Parts Cleaning Tank
Portable Crane, 2 Ton
Puller Sets
Steam or Detergent Cleaner
Transmission Jack(s)

Engine

Arbor Press
Axle Stand(s)
Battery Charger
Bench Grinder
Engine Analyzer
Floor Jack(s)
Gear Puller Set
Hot Tank
Hydraulic Press, 25 Ton
Oxy-Acetylene Welder
Parts Cleaner
Portable Crane, 2 Ton
Steam or Detergent Cleaner
Valve Shop including refacer and seat grinder